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Parental gender bias and investment in children's health and education: evidence from Bangladesh

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Abstract

Studies have documented a gender bias in intrahousehold resource allocations in developing countries. Combining a field experiment allocation task and a household survey conducted in Bangladesh, we examine the association between parental gender bias and investment in children's health and education. The task was designed to circumvent the problem in which children's education attainment and health status or parents' expenditure on their children would affect allocation decisions; the outcome did not directly affect the subjects themselves or their own children. The task measures *systematic* bias arising possibly from sociocultural and religious norms. Biased parents allocate resources in a discriminatory manner. Boy-biased parents are more likely to enrol boys and to spend more on boys' education. They are less likely to seek formal treatment and to spend less when a girl is sick. Girl-biased parents do not seem to differentiate between sons and daughters with respect to education or health.

JEL classifications: C93, D13, J16, J13

1. Introduction

Gender bias in developing countries has received considerable attention. Many existing studies have documented that in developing countries disparities exist in the intrahousehold resource allocation between sons and daughters (Orazem and King, 2007; Barcellos *et al.*, 2014). In general, findings suggest that households spend less on girls' education and that girls have a lower probability of being enrolled in school, attain less schooling, receive lower quality schooling, and achieve poorer grades (Drèze and Sen, 1995; Gong *et al.*, 2005; Kingdon, 2005). Similarly, many studies suggest gender differences in nutrition/health status, mortality rate, and access to healthcare (Chen *et al.*, 1981; Das Gupta, 1987; Borooah, 2004; Jayachandran and Kuziemko, 2011).

One of the major explanations in the literature for the gender gap in schooling or health is labor market discrimination or earning function bias towards males (Bardhan, 1974; Rosenzweig and Schultz, 1982; Neumark, 1988). Economic returns from investments in daughters may also be lower due to lower female participation in the labor market or income-generating activities (Rosenzweig and Schultz, 1982; Schultz, 1982; Qian, 2008). Besides these labor market forces, different economic returns may also arise from social norms or cultural practices; for example, in societies in which a son provides old-age support to parents, returns to parents of investing in sons rather than in daughters is much higher. In many patriarchal societies, the marriage system is such that the bride's family pays the dowry and/or bears the major marriage costs. As the woman will then reside with her husband's family, she has little or no scope to provide support to her natal family. Further, in such societies, women are often deprived of inheritance rights, which may be a direct outcome of the religious teachings that are an integral part of the culture in many Asian societies. Here, intergenerational transfer of property is only possible through sons (Das Gupta, 1987; Kishor, 1993). Due to all these forces, parents may face a higher return function for boys and, therefore, a higher investment in boys over girls reflects a rational economic response on the part of the parents (Becker, 1991).

Apart from the different economic returns, sociocultural and religious norms can also bias parents against a particular gender. Rose (2000) argues that poverty or resource constraint is the source of parental bias, while Basu (1989) finds evidence of stronger bias in households with greater socioeconomic status. Many authors (Kabeer, 1988; Pande and Astone, 2007; Glaeser and Ma, 2013) view gender bias as a structural phenomenon; that is, established social norms and institutional settings in a patriarchal society define the different roles, rights, or obligations for men and women. Religion often exacerbates the patriarchal norms practiced in a society by secluding women, restricting their mobility, curtailing opportunities to work outside the home, and marrying girls off at early ages (Kishor, 1993). Thus, gender stereotyping or beliefs about women's ability can be formed through age-old processes of sociocultural structure, religious norms, or economic factors, with these beliefs differing among cultures and over time. Such beliefs, however, are often based on persuasion or preadult influences and do not necessarily reflect reality (Glaeser, 2005; Glaeser and Ma, 2013). For example, studies in social psychology suggest that there exists a common belief that women are less competent than men in many workplace-related tasks (Goldberg, 1968; Eagly and Mladinic, 1994; Ridgeway and Correll, 2004), or in science and mathematics (Gunderson *et al.*, 2012). Persons holding this sort of discriminatory belief or attitude may invest less in girls.

We contribute to this literature by examining whether the gender bias of parents identified through an allocation task predicts their real-life decision-making regarding their allocation of resources between sons and daughters. To this purpose, we extend our work in Begum *et al.* (2018). We use outcomes from the Begum *et al.* lab-in-the-field allocation task with parents of school-age children in Bangladesh. The task was designed such that the outcome did not directly affect the subjects themselves or their own children. The money was used to provide school supplies to students of the indicated gender.[1] The Begum design

1 Alternative procedures were considered. One required allocation to own children. This was dismissed since the parent would know how much each child received and, post-study, could demand that the child relinquish the money, rendering the allocation decision irrelevant. A second was to have a parent allocate money to another couple's children. This raised consent problems and

circumvents the problem in which children's real-life education attainment and health status or parents' real-life expenditure on their own children would affect how parents split the money in the experiment.[2] Begum *et al.* (2018) examine whether there is any *systematic* bias, arising possibly from sociocultural and religious norms, among fathers and mothers, and whether such bias differs when they make their allocation decisions. The Begum *et al.* allocation task was conducted with two mutually exclusive groups each making either individual or joint decisions. Individuals (or couples) distributed the equivalent of one day's (two days') wages between male and female students.

Begum *et al.* (2018) report that there are many parents who reveal bias, but no *systematic* bias by either parent in their individual decisions; the proportion of parents favoring boys or girls is very similar. Joint decisions elicit more biased choices than do individual decisions, but again no systematic bias.

In this paper, we examine whether the bias exhibited by fathers and mothers in the allocation task predicts observed parental decisions on health and education of their own children. We test if allocation bias in favor of boys (girls) is reflected in discrimination in education and health expenditures against girls (boys). Actual health and education decisions by our sample of parents were collected during extensive surveys conducted before the allocation task.

The main contribution of this paper is determining whether the revealed gender bias of parents predicts their real-life decision-making regarding their allocation of resources between sons and daughters. We focus on the subset of parents who showed bias, whether to boys or to girls, in the lab-in-the-field experiment. We examine how these biased parents allocate resources for the education and health of their child (children). We link the survey data on education and health expenditures with each of the parents' experiment revealed preference. We compare these results with those parents who were revealed to be unbiased. To the best of our knowledge, this is the first study in which children's outcomes or intra-household allocations in real life are related to parental bias identified through an experimental approach.

Our results indicate that compared with unbiased parents (UPs hereafter), boy-biased parents (BBPs hereafter) are more likely to enrol their sons in school and to spend more on their sons' education (see Online Appendix Table A5 for a list of all abbreviations). Girl-biased parents (GBPs hereafter) do not seem to differentiate between sons and daughters with respect to education. In terms of health, BBP are less likely to seek formal treatment and tend to spend less when a daughter is sick, compared with UP. However, GBP do not differentiate between sons and daughters in seeking treatment or expenditure on treatment.

parents, knowing the rules, might try to retrieve the money given to their children. Also, the allocating parent might believe the money would be confiscated by the child's parents and not directly

2 It is possible that, in our low-stakes, no-personal-consequences environment allocations could be driven by different sets of motives. For example, as one's own outcomes are not at stake, if there is a prevailing perception that girls are disadvantaged in society in general, subjects might be inclined to allocate more to girls. We, however, do not believe this is likely. This argument implies that if boy-biased individuals believe girls are disadvantaged, they will, in this case, give more to girls. We believe it unlikely that boy-biased individuals would be inclined to believe that girls are disadvantaged. Rather, it is more likely that this type of person does not accept that girls are disadvantaged, but rather believes that a bias favoring boy is appropriate, that the world is right as it is.

When we examine the individual bias of each parent, we find that boy-biased fathers (BBFs hereafter) have a higher probability of enrolling sons in school and spending more on boys' education compared with an unbiased father (UF hereafter). In contrast, sons of girl-biased mothers (GBMs hereafter) are less likely to be enrolled, compared with sons of unbiased mothers (UMs hereafter).

We find that education expenditures are slightly higher for daughters of GBM, compared with *UM*. This differing association of fathers' and mothers' bias is consistent with empirical literature that suggests a different effect of father's and mother's income or education on boys and girls (Thomas, 1990; Emerson and Souza, 2007). The results also suggest that a father's bias matters more than a mother's bias. The association of parents' joint bias with children's schooling is reflected mostly in the association with father's individual bias but not the mother's bias. We do not see any significant association between parental bias and children's schooling for both girl-biased fathers (GBFs hereafter) and boy-biased mothers (BBMs hereafter). While both boys and girls of GBF are less prone to illness compared with children of UF, no other association is found between individual parental bias and health indicators.

The finding that BBP favor boys but that GBP do not preference either girls or boys implies that perceived labor market discrimination or social norms that contribute to different returns for boys and girls dominate in ultimate parental decisions. These factors reinforce parental bias favoring boys and counteract parental bias favoring girls.

The main findings are that our experimental measure eliciting preferences towards gender due to social norms predicts the real-life behavior. Parents revealed by our measure to be boy biased were more likely to allocate resources in a discriminatory manner; they are more likely to enrol boys and to spend more on boys' education and are less likely to seek formal treatment and to spend less when a girl is sick. Note, while our experiment results identify the bias due to social/cultural norms, our survey evidence is influenced by both economic and social/cultural factors. We therefore cannot say if the association between the observed bias by BBP is due to economic factors, social/cultural norms, or both. In the case of parents biased towards girls, this bias is inconsistent with the popular notion that parents in South Asia are boy biased.

2. The allocation task and the data

There are 64 districts in Bangladesh. We conducted the survey and allocation task in 2012 in 55 villages of two districts (Khulna and Satkhira) in southwestern Bangladesh. These districts are typical of Bangladeshi districts. They were chosen as the research team has been working on other projects in those districts for a number of years. Villages averaged 1,000 households. These villages were selected randomly from the region. Households from these villages were also selected randomly among the families with school-age children—the population of interest in this study—as they are making actual human capital investment decisions for both boys and girls. Note that we did *not* restrict the sample to only households with children at school; we drew our sample from *all* households with school-age children, including those families with no school-going child. Between 4 and 20 households were randomly selected from each village, depending on the size of the villages and the target households. Participating households were randomly assigned to one of the two mutually exclusive treatment groups. Our final sample consists of 507 households (1,014 individuals). Since the design of our allocation task required both husband and wife to participate, we conducted the study outside the rice cultivation and harvesting seasons, when males were most likely to be working from home. Fewer than 10 households selected could not participate in the activity as both parents were not present at the time the survey and allocation task was to be conducted. The survey and task were administered by enumerators who were supervised by trained research assistants with experience in conducting field experiments. The supervisors and all enumerators were trained and given guidelines for the study by the authors.

Enumerators went to the selected households and invited the parents to participate. If both parents agreed, the process was explained. Subjects were informed that a general household survey was to be conducted, that participants would receive compensation, and that both parents must participate. We conducted the survey and allocation task in subjects' homes because of the concern that subjects might behave differently in an artificial environment. To address the concern that subjects might be influenced by gossip among neighboring households, all households in a village participated on the same day and all households within the same *para* (neighborhood) participated at the same time. Enumerators, locally recruited graduates fluent in the local dialect, administered the surveys and tasks.

2.1 The allocation task

Begum *et al.* (2018) designed the allocation task to understand parental attitudes toward different-gendered children. Parents divide a sum of money between anonymous girl students and anonymous boy students attending schools in the region. Prior to surveying parents, schoolteachers, village leaders, parents, and elders were informed about the procedure for donating money from the task to the boy and girl children in schools. This helped to ensure that schools would divide the money between boys and girls as instructed.

The enumerators gave a copy of written instructions to each parent, read them aloud, explained the procedures and instructions of the game, and answered any questions (see Online Appendix B for instructions). The participants were assured about the anonymity of their decisions at the beginning of the task. The anonymity of decisions and the fact that the task outcome did not affect the decision maker(s) directly minimize any motivation for the subjects to hide their true preferences.[3] After receiving and hearing the instructions, the parents could choose to participate or not, and could withdraw from the task at any time; none did. The task started once the parents understood the procedures of the game. The survey and allocation task were typically completed within 2 h.

The two treatments differ in terms of making decision jointly or individually. In the individual decision treatment, fathers and mothers are each given the two envelopes—one marked 'girl' with a stylized picture of a girl, the other marked 'boy' with a stylized picture of a boy—and endowments of 120 taka each (four 5-taka notes and ten 10-taka notes; 120 taka ≈ US$1.70 at the time of the study, approximately the average daily wage of an adult). The envelopes were labeled with the drawings because some parents may have been illiterate. Envelopes were marked with ID numbers to allow matching of allocation decisions and

3 Begum *et al.* (2018) include two additional treatments, RI and RJ, in their design. In these treatments, parents are forced to either favorably bias boys (give two-thirds of the endowment to boys) or favorably bias girls (give two-thirds of the endowment to girls). The objective of these treatments is to observe whether subjects accurately reveal their preferences in the unrestricted treatments. The restricted treatments' results do not systematically differ from the unrestricted treatments' results, suggesting that the unrestricted treatments' results are reasonably accurate measures of bias.

survey responses. Considering that most women are not wage earners, the total payment per couple (240 taka) would have been attractive to these households.

The samples for individual or joint treatment groups were determined randomly. Hence, we do not need to worry about the factors affecting both parents' choices in the allocation task and investment in children's education and health, as we compare between two treatment groups that were assigned randomly. The same applies for the potential concern such as the issue that unobserved real-life children's characteristics (ability, self-control, patience, etc.) might affect both parents' choices in the allocation task and investment in children's education and health. Also, parents allocated money *not* for their own children but for anonymous children. Hence, the decisions they made in the tasks also avoid the potential criticism that parents might prefer own children with higher ability in real life and thus bias decisions towards that gender, and children with higher ability might obtain more investment in education and health. We were aware of such potential concern, as otherwise results would have been biased.

To maintain the anonymity of the decisions, each parent was randomly assigned an ID number and the number was never associated with the individual's name. The envelopes were marked with the parent's ID number. Each parent separately went to a room or closed area in their residence so that they could not hear or communicate with each other and divided the money between the two envelopes according to their individual preferences. When the parent returned to the main room, the envelopes were handed to the enumerator, who placed them in a sealed box.

In the joint decision treatment, parents were given 240 taka (8 5-taka notes and 20 10-taka notes) and two envelopes. The envelopes were marked with the parents' ID numbers. Both parents went to a second room or in a closed area in their residence and divided the money between the two envelopes according to their joint preferences. When the parents returned to the main room, the envelopes were handed to the enumerators who placed them in a sealed box.

Individual and household level survey data were collected immediately following allocation decisions. The survey collects detailed individual, household, and village level information. Either of the parents or both jointly provide the household level general information. However, individual level attitudinal questions were answered separately and privately by each parent. In each case, an enumerator read the instructions to the parents and ensured that they both fully understood them. In order to maintain trust, participants were invited to attend a public ceremony the same or the following day when the envelopes would be opened in front of a representative from the school receiving the money and a local leader; most attended the ceremony.

2.2 Summary statistics

Online Appendix Table A1 presents the descriptive statistics by treatments. Boy and girl children are almost equally divided in each treatment and they do not differ between joint and individual treatments. Children's age is also similar between the two treatments. In terms of educational outcomes, there is a slight difference, but the difference in expenditure on education between the two treatments is not significant statistically. We also observe that fathers in the joint and individual treatments are of similar age. Mother's age is also very similar; they do not differ by more than eight months on average. The mean ages of the fathers and mothers are 43 years and 34–35 years, respectively. Fathers and mothers in both treatments have, on average, a primary school education. The mean yearly income of

Table 1. Outcome of the game by two treatment groups

	(1)		(2)	
	Joint		Individual	
	Mean	SD	Mean	SD
Money allocated to girl (taka)				
Joint	118.9	20.7	–	–
Father	–	–	60.5	10.4
Mother	–	–	59.9	7.09
Unbiased (% unbiased)				
Joint	0.401	0.491		
Father	–	–	0.635	0.482
Mother	–	–	0.700	0.459
If biased (% biased toward girls)				
Joint	0.466	0.501		
Father	–	–	0.504	0.502
Mother	–	–	0.505	0.503
Number of households	197		310	

Source: Begum *et al.* (2018).

the households among the groups is 93–100,000 taka. There are slight differences in terms of household income and no significant differences in land holding between treatments. Overall, we find that the individual and joint treatments are similar in a number of observable characteristics. We still control for all these characteristics in our regression to account for any differences across treatments.

Table 1 summarizes the allocation task outcome in the two treatments. The mean allocated amount in both treatments is roughly gender balanced. The proportions of BBPs, BBF, and boy-biased mother (BBM) are roughly equal to the proportions of GBPs, GBF, and girl-biased mother (GBM). Overall, the task outcome suggests that, on average, there is no parental bias. Most of the fathers and mothers are unbiased in their individual decisions (64% and 70%, respectively), but most of the couples in their joint decision chose a biased split (60%).[4] Begum *et al.* (2018) considered why more bias was observed in joint decisions than in either of the individual decisions. They suggested that one possible explanation is that biased individuals may have made the decisions alone or dominated the decision-making process.[5] They argue that the more biased split in joint decisions than in individual decisions can be explained, at least partly, by the noncooperative bargaining behavior between the parents in the household decision-making process.

4 Note that these results are based on two treatments and samples are randomly chosen for each treatment; hence, participants in experiments do not overlap. The results do not imply that the majority of unbiased individuals are matched with biased spouses, or somehow two unbiased individuals came up with a biased outcome jointly. Rather this reflects the decision when spouses are making joint decisions. For more details, see Begum *et al.* (2018).

5 This is consistent with Carlsson *et al.* (2012); their result from an experiment on intertemporal choice suggests that both parents influence the joint decision, with the father exerting a stronger influence.

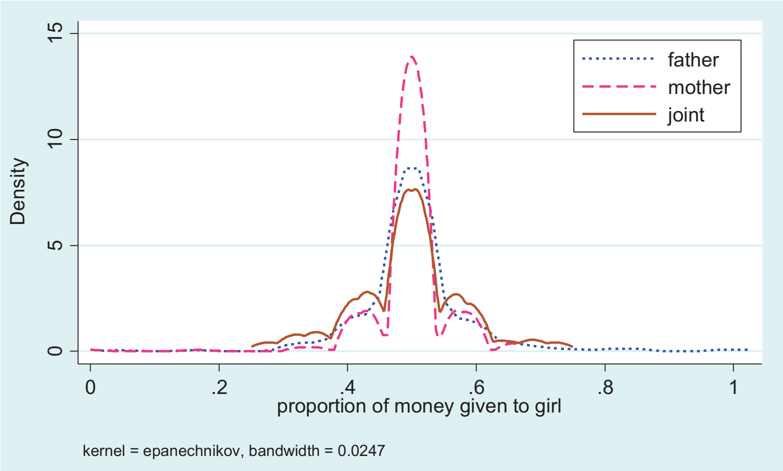

Fig. 1. Distribution of endowment, UI and UJ treatments.
Source: Begum *et al.* (2018).

While on average there is no gender bias, there is considerable heterogeneity as some subjects are girl biased and others are boy biased (see Fig. 1). In this paper, we exploit this heterogeneity. We explore whether the identified parental bias is reflected in parents' actual decisions related to the schooling and health of their own children. Moreover, because the actual allocation of household resources is often made through an intrahousehold bargaining process by a joint decision of husband and wife (Browning and Chiappori, 1998), we focus our analysis on the parents' joint decision.

We control for several observable factors such as role of gender or gender composition of the children of parents, parental income, education, and socioeconomic background. We consider outcomes relating to a child's schooling such as years of schooling; enrolment in school; and education expenditure (for last six months). We also consider health indicators such as incidence of illness (whether a child was ill in the last year); formal treatment (whether the child received any formal treatment, if ill); and treatment cost for the child, if ill. Online Appendix Table A2a and b present the descriptive statistics of the outcome variables by parental bias in joint and individual treatment groups, respectively.

3. Empirical approach

Begum *et al.* (2018) defined bias as any deviation, whether individually or jointly, from an even split. Boy bias or girl bias is identified with unequal splits favoring boys or girls, respectively. In order to identify how such parental bias is associated with the schooling or health investment or outcome of their children, we report regression analysis separately for the joint treatment sample and the individual treatment sample.

In order to examine whether the joint parental bias is associated with the schooling/health investment/outcome of their children, we run the following regression using the *joint* treatment sample:

$$Y_{ij} = \alpha_0 + \alpha_1 \text{bias}_{pj} + \alpha_2 \text{girl}_{ij} + \alpha_3 \text{girl}_{ij} * \text{bias}_{pj} + \alpha_4 X_{ij} + \alpha_5 H_j + \xi_{ij,} \quad (1)$$

where Y_{ij} is the outcome of interest such as schooling or health investment/outcome for child i in household j;[6] bias_{ij} indicates a set of dummy variables indicating parental bias[7]; girl_{ij} represents child gender and equal to 1 for a girl; X_{ij} is a vector of variables representing individual and sibling characteristics of child i in household j; and H_j is a vector of variables representing parental/household characteristics.[8]

We are mainly interested in the coefficients α_1, the association with parents' joint bias, and α_3, whether parents' bias has any different association on boys and girls. The standard errors are corrected for clustering at the village level.

In order to identify whether the individual bias of the father and mother is associated with the schooling/health investment/outcome of their children, we run the following regression using the *individual* treatment sample:

$$Y_{ij} = \varphi_0 + \lambda_f \text{bias}_{fj} + \lambda_m \text{bias}_{mj} + \delta \text{girl}_{ij} + \lambda_f \text{bias}_{fj} * \text{girl}_{ij} + \lambda_m \text{bias}_{mj} * \text{girl}_{ij} + \rho X_{ij} + \gamma H_j + \mu_{ij,} \quad (2)$$

where bias_{ij} indicates a dummy for bias of a parent i in household j, with $i = f$ indicates father and $i = m$ indicates mother, and Y_{ij}, girl_{ij}, X_{ij}, and H_j are defined as above. λ_f and λ_m are the coefficients for individual bias by father and mother, respectively. β_f and β_m are the coefficients that reflect different bias against girls by father and mother, respectively.

4. Estimation results

4.1 Parents' joint bias

We first examine how the measure of both parents' joint bias is associated with the actual schooling or health of their own children. The regressions are based on Equation (1) for the sample of households that participated in the joint treatment.

6 We use absolute expenditure rather than log of expenditure as some households reported zero expenditures on education or health for the reference period. This is plausible since educational items such as books and tuition are free for children in primary schools. Furthermore, our main results are based on the raw data and we use the raw educational expenditure to maintain consistency between results in regressions and the descriptive tables in Online Appendix A.

7 It includes three categories: unbiased, boy-biased, girl-biased, with unbiased being the base category in all regressions we report in the paper. We also considered an alternative definition of

8 Individual and sibling controls: age, age square, interaction of age and gender, number of brothers of the child, number of older siblings, and a vector of dummies indicating number of siblings; parental and household controls: vector of dummies indicating the highest education level among parents and indicating the occupation of the household head, mother's age, a dummy variable for whether the household head is Muslim and for whether the household has electricity, household's landholding per capita, and a village dummy. For health indicators, the illness regression includes additional controls for access to safe water and sanitation; the regressions for formal treatment and treatment cost also include additional controls for the duration of illness.

4.1.1 Parental gender bias and children's education Schooling at the primary level (grades one to five) in Bangladesh is free and involves little or no cost, so the opportunity cost of a child attending is low. Thus, variation in schooling will mainly occur at the post-primary level. Therefore, we focus on children aged 11–18 years who could be in grades 6–12, in order to examine the association of parents' joint bias with the actual schooling of their children.[9] Table 2 provides OLS estimates of the association between joint parental bias and education of their children, including a full set of unreported individual, sibling, parental, and household controls, and village-fixed effects. We also perform the analysis with a sample including both primary and post-primary children (aged 6–18 years). The results are consistent and are reported in Online Appendix Tables A3 and A4. We also used grade for age as an alternative measure of educational attainment of the children. The results are similar.

Table 2, Column 1, suggests no significant association between parental bias and years of schooling of either sons or daughters. Column 2 indicates that the probability of a son's enrolment in a school is 13%age points higher for BBPs than for UPs ($p < 0.05$). The interaction of BBP and girl is negative and significant ($p < 0.05$) with slightly greater magnitude (-0.176) indicating that the likelihood of a daughter's enrolment is 5%age points less for BBPs than UPs. The coefficients are smaller when we include samples of students in both primary and post-primary children age (Online Appendix Table A3, Column 2), suggesting that the association is mainly driven by the post-primary children.

In the dataset, we have information on education expenditures for the six months prior to the study for each child in the household. The results in Column 3 suggest that the half-yearly education expenditures for a son are 403 taka more for BBPs relative to UPs ($p < 0.10$). This represents 30% of the average education expenditure on children by the joint treatment households (1,322 taka). The interaction term (of BBP and girl) is negative (-741.3) and significant ($p < 0.01$), suggesting that the education expenditures on a daughter are 338 taka less for BBP compared with UPs, a decrease of 26% relative to average education expenditures.[10] The magnitudes of the coefficients, again, are much greater for the post-primary group than those for the full sample (Online Appendix Table A3, Column 3).

4.1.2 Parental gender bias and children's health We investigate the association of parents' joint bias with the health of children aged less than 16 years by considering the following health indicators: incidence of illness and, in the case of illness, whether the child receives formal treatment, and treatment cost.[11] We define incidence of illness by a dummy variable indicating whether the child was ill during the previous year, based on the parents' survey responses. In defining 'illness', we include common diseases such as common fever or respiratory diseases and diseases arising from nutritional deficiency. We do not consider

10 Including children in the sample who are not enrolled in schools may give a biased estimate of expenditure on education. Therefore, we also run the regression with an alternative sample including only those children who are enrolled. The results, not reported, are similar.

11 We do not include children aged 16 years or above, as the data for health status are mostly missing for those children.

Table 2. Association of joint parental bias with children's education

	(1) Years of schooling	(2) Enrolment status	(3) Education exp. (taka)
Parents' bias			
Boy-biased	0.054	0.127**	403.5*
	(0.466)	(0.053)	(209.2)
Girl-biased	−0.108	−0.021	−89.79
	(0.397)	(0.058)	(177.2)
Parents' bias * girl			
Boy-biased * girl	−0.359	−0.176**	−741.3***
	(0.824)	(0.065)	(230.2)
Girl-biased * girl	−0.413	0.013	−181.3
	(0.617)	(0.067)	(231.7)
Girl	3.18	−0.302	−759.6
	(1.98)	(0.217)	(912.1)
Observations	239	341	311
R-squared	0.578	0.387	0.271

Notes: ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. The standard errors (in parentheses) are corrected for clustering at the village level. The sample size differs between Columns 1 and 2 as we include children aged 12–18 for years of schooling. See more explanation in the text. The base category for 'parents' bias' is unbiased. The regressions are based on a full set of controls, viz., individual and sibling controls including age, age square, interaction of age and gender, number of brothers of the child, number of older siblings, and a vector of dummies indicating number of siblings; parental and household controls including a vector of dummies indicating the highest education level among parents and indicating the occupation of the household head, mother's age, a dummy variable for whether the household head is Muslim and for whether the household has electricity, and the household's landholding per capita; and a village dummy. The samples include children in households involving joint decisions.
Source: Authors' calculations.

any illnesses that might not be caused by less care (e.g., broken hands/legs) or female diseases such as uterine infections.

Table 3 reports the estimation results of the association between joint parental bias and health of their children, including a full set of unreported individual, sibling, parental, and household controls, and village-fixed effects. Column 1 reports the estimation results for children's illness; Column 2 reports the estimation results for formal medical treatment. This includes advice from a certified doctor (allopathic or homeopathic) or treatment in hospital (private or public); treatment from a village practitioner (uncertified), advice from pharmacy salesmen, and the like are categorized as informal treatment. Column 3 reports the estimation results for children's treatment cost over the last year, considering any type of illness. The sample includes children aged 0–15 years in households involving joint decisions.

The results in Column 1 suggest no significant association of parents' joint bias with their children's illness. Column 2 results indicate that, for boys, there is no significant association of formal treatment with their parents' joint bias. However, for girls, the result is different. BBP interacted with the girl dummy variable has a negative (−0.161) and significant coefficient ($p < 0.05$), indicating that daughters of BBPs are less likely to receive formal treatment, compared with daughters of UPs. The results reported in Column 3 for boys are quite similar to the results for formal treatment (Column 2), suggesting that for sons,

Table 3. Association of joint parental bias with children's health

	(1) Incidence of illness	(2) Formal treatment	(3) Treatment cost (taka)
Parents' bias			
Boy-biased	0.041	−0.007	76.9
	(0.052)	(0.040)	(71.9)
Girl-biased	−0.044	−0.029	−32.6
	(0.072)	(0.044)	(76.5)
Parents' bias * girl			
Boy-biased * girl	−0.008	−0.161**	−326.7***
	(0.089)	(0.063)	(91.0)
Girl-biased * girl	−0.009	−0.075	−125.6
	(0.084)	(0.086)	(126.1)
Girl	0.058	0.109	426.5
	(0.120)	(0.186)	(300.1)
Observations	432	316	316
R-squared	0.626	0.207	0.398

Notes: *** and ** indicate significance at the 1% and 5% levels, respectively. The standard errors (in parentheses) are corrected for clustering at the village level. The base category for 'parents' bias' is unbiased. The regressions are based on a full set of controls, viz., individual and sibling controls including age, age square, interaction of age and gender, number of brothers of the child, number of older siblings, and a vector of dummies indicating number of siblings; parental and household controls including a vector of dummies indicating the highest education level among parents and indicating the occupation of the household head, mother's age, a dummy variable for whether the household head is Muslim and for whether the household has electricity, and the household's landholding per capita; and a village dummy. The illness regression (Column 1) includes additional controls for access to safe water and sanitation; the regressions for formal treatment and treatment cost (Columns 2 and 3) also include additional controls for the duration of illness. The sample includes children aged 0–15 years in households involving joint decisions.
Source: Authors' calculations.

treatment cost is not associated with parents' bias. However, BBP interacted with a girl dummy variable has a negative and significant coefficient ($p < 0.01$), indicating that expenditures on a daughter's treatment cost are, on average, 327 taka less for BBPs, compared with daughters of UPs. We find no significant association between GBPs and these health-related indicators of their children.

4.2 Individual parents' bias

The collective model of household behavior presumes that the ultimate household decision is an outcome of the different preferences as well as the relative bargaining power of the members (Browning and Chiappori, 1998). In the context of this study, it is therefore interesting to explore how individual parental bias is reflected in the household decisions regarding children's schooling and health.

4.2.1 Mother's or father's gender bias and children's education Table 4 reports the regression results for the outcome variables on education for children aged 11–18 years in the households involving parents' private and individual decisions (Online Appendix Table A4 reports the results for the sample including children aged 6–18 years). We run Equation (2) with a full set of unreported controls. Column 1 suggests that years of schooling are not

Table 4. Association of individual parental bias with children's education

	(1) Years of schooling	(2) Enrolment status	(3) Education exp. (taka)
Father's bias			
Boy-biased	−0.016	0.101***	536.1***
	(0.187)	(0.027)	(182.4)
Girl-biased	−0.573	−0.018	−90.4
	(0.353)	(0.039)	(161.2)
Mother's bias			
Boy-biased	−0.184	0.040	−34.9
	(0.365)	(0.030)	(162.1)
Girl-biased	−0.389	−0.166***	−325.8*
	(0.354)	(0.056)	(183.2)
Father's bias * girl			
Boy-biased * girl	0.082	−0.097**	−601.5**
	(0.267)	(0.044)	(222.1)
Girl-biased * girl	0.304	−0.007	−183.9
	(0.391)	(0.061)	(188.0)
Mother's bias * girl			
Boy-biased * girl	0.164	−0.041	70.5
	(0.405)	(0.063)	(224.0)
Girl-biased * girl	−0.283	0.174**	475.5**
	(0.414)	(0.083)	(207.1)
Girl	0.677	0.113	615.3
	(0.928)	(0.121)	(560.6)
Observations	391	505	485
R-squared	0.788	0.209	0.304

Notes: ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. The standard errors (in parentheses) are corrected for clustering at the village level. The base category for 'parents' bias' is unbiased. The estimations include full set of controls as mentioned in Table 2. The sample includes children in households involving individual decisions. The sample size differs between Columns 1 and 2 as we include children aged 1.
Source: Authors' calculations.

significantly associated with the systematic bias of any parent. Column 2 indicates that the probability of a son's enrolment in a school is 10%age points higher for BBFs than for UFs ($p < 0.01$). The interaction term of BBF with the girl dummy is negative and significant with a similar magnitude (−0.097, $p < 0.05$) suggesting that probability a girl is enrolled is not significantly different for BBFs and UFs. On the other hand, the probability of a son's enrolment in a school is 17%age points less for GBMs than for UMs ($p < 0.01$). However, the interaction term of GBM with girl is of similar magnitude and significant with the opposite sign (0.174, $p < 0.05$), indicating again that the enrolment of girls is not significantly associated with mother's bias.

Column 3 reports the association of each parent's individual bias with the prior six months' education expenditures on their children. The association with father's bias is similar to that for joint bias reported in Table 2. The result suggests that education expenditures for the sons of BBFs are significantly higher (by 536 taka) compared with UFs ($p < 0.01$). The interaction term (BBF with girl) is negative and significant ($p < 0.01$) with slightly greater magnitude (−601), suggesting that education expenditure on daughters of BBFs is slightly less (by taka 65) compared with UFs. The results indicate that GBMs spend less on the education of sons and more for the education of daughters, compared with UMs.[12]

4.2.2 Mother's or father's gender bias and children's health **Table 5** reports the regression results for the association between each parent's individual bias and their children's health indicators. The results in Column (1) suggest that the sons of GBFs are approximately 9%age points less likely to be ill compared with UFs ($p < 0.05$), while the GBFs daughters' likelihood of illness is not significantly different from daughters of UFs. A mother's bias, however, is not associated with her children's illness. The results in Columns 2 and 3 suggest that neither formal treatment nor the treatment cost is associated with the bias of either of the parents.

5. Robustness checks

In this study, we use results from the Begum *et al.* (2018) allocation task, in which some money is given to parents, and parents divide that money between anonymous girl students and anonymous boy students attending schools in the region. The task was designed such that this allocation is free from parents' personal decisions which are affected by different economic returns to boy versus girl child. We use the allocation difference as an indicator of bias (boy bias, girl bias, and unbiased) and test whether measured bias correlates with the actual decision of parents make in their daily lives. An important consideration is whether or not Begum *et al.* (2018) allocation tasks reveals parents' true culturally induced, systematic bias.

Begum *et al.* (2018) conducted two additional treatments to test the robustness of their findings regarding parental bias. In their restricted individual (RI) design, individual parents were forced to strongly prefer either the boy or the girl in their allocations. They were forced to choose between two boy/girl splits: 80/40 or 40/80. Likewise, in their restricted joint (RJ) design, parents were forced to choose between two boy/girl splits: 160/80 or 80/160.

The RI and RJ designs prevent biased individuals (couples) from hiding their bias; the individuals (couples) have to either reveal their true bias or reveal a strong, opposite preference. Begum *et al.* (2018) argue that individuals (couples) are more likely to choose the allocation consistent with their real bias. If individuals (couples) are systematically biased then the percentage of choices biasing girls should be significantly different from 50%; if systematically unbiased, the percentage of choices biasing girls should not differ significantly from 50%. Furthermore, if choices from UI (UJ) do not systematically differ from RI (RJ), then this suggests that UI and UJ are reasonably accurate measures of bias; if these paired results are systematically dissimilar, then this suggests that UI and UJ provide inaccurate measures of bias. Begum *et al.* (2018) report that individuals (couples) are as likely to bias girls as boys. They conclude that their allocation tasks are accurately measuring systematic parental bias.

12 The association with father bias is similar, but that with mother bias disappears when the sample includes children who are only enrolled in schools. Thus, the relationship between mother's bias and children's education expenditure is mainly driven by the enrollment decision.

Table 5. Association of individual parental bias with children's health

	(1) Incidence of illness	(2) Formal treatment	(3) Treatment cost (taka)
Father's bias			
Boy-biased	−0.027	0.085	−216.9
	(0.043)	(0.139)	(212.6)
Girl-biased	−0.088**	−0.096	−146.6
	(0.0415)	(0.063)	(140.2)
Mother's bias			
Boy-biased	0.0180	0.115	75.0
	(0.044)	(0.101)	(206.7)
Girl-biased	0.057	0.109	260.5
	(0.040)	(0.125)	(244.6)
Father's bias * girl			
Boy-biased * girl	−0.043	0.014	−178.6
	(0.051)	(0.088)	(430.0)
Girl-biased * girl	0.093	0.030	−387.8
	(0.058)	(0.050)	(324.4)
Mother's bias * girl			
Boy-biased * girl	0.077	−0.086	991.4
	(0.068)	(0.083)	(796.1)
Girl-biased * girl	−0.025	−0.077	−111.8
	(0.046)	(0.062)	(323.3)
Girl	−0.127	0.104	−679.8
	(0.127)	(0.227)	(603.2)
Observations	666	407	401
R-squared	0.685	0.342	0.301

Notes: ** indicates significance at the 5% level. The standard errors (in parentheses) are corrected for clustering at the village level. The base category for 'parents' bias' is unbiased. The estimations include the full set of controls as mentioned in Table 3. The sample includes children aged 0–15 years in households involving individual decisions.
Source: Authors' calculations.

A second consideration is the fact that we adopted a strict definition of unbiased; an equal split of the endowment between boys and girls. We retest our results employing a more relaxed definition of unbiased, including in our definition of defining unbiased any 65/55 split by individuals and any125/115 joint split. This definition allows any, relatively, inconsequential bias as well as carelessness and/or tremor of the hand on the part of the decisionmaker(s). We reran our analysis and find that our results are robust to using this more relaxed definition of unbiased.[13] The results are qualitatively the same—in some cases, the magnitudes of coefficients and levels of significance change but the conclusion remains the same.

6. Conclusions

Gender bias in developing countries has received much attention. However, observed bias could reflect systematic bias or it could arise because of labor market situations or concern

13 Results available upon request.

regarding old age supports for parents. Therefore, gender differences in intrahousehold human capital might be due to different economic returns and/or parental tastes or preferences towards a particular gender. Researchers have argued that economic factors alone are not sufficient to explain the existing gender bias in society; rather, the gender stratification that has emerged from centuries-old norms regarding women's status are important sources of this bias (Pande and Astone, 2007). This study uses outcomes from a field study in Bangladesh, in which parents allocate money to an anonymous boy and/or girl, to identify parental bias, and relate that to actual parental decisions made for their children's education and health. We are thus able to examine how parental gender bias is associated with intrahousehold human capital investment.

Overall, the results suggest that parental bias has an association with investment in children's education and health in such a way that the parental bias favors boys. In particular, a son's education is associated positively with the parents' boy bias but is not associated negatively if the parents are biased to the girl. Hence, even if parents are biased against the boy, this is not reflected in parental investment on a son's schooling or health. On the other hand, a daughter's education and health is not positively associated with parental girl bias and is associated negatively if parents are biased against girls. This signifies that there are other factors that drive ultimate parental decisions.

In terms of individual parental bias, the results suggest that a father's bias is associated positively with a son's enrolment and education expenditures, and negatively with a daughter's education expenditures. In contrast, a daughter is slightly more likely to be enrolled if a mother is girl biased. Education expenditures on a daughter are slightly more if the mother is girl biased. The different association of parental bias with children's education mostly reflects that of a father's bias, particularly for enrolment and education expenditures. The results suggest that heterogeneity is an important aspect to be considered when examining gender bias. Among the parents found to be biased towards boys, we find that parental bias captures the allocation of actual resources for the boys, but parental bias towards a girl is not reflected in favoring girls. Further, bias against a girl is reflected in discrimination against girls, but no such pattern exists for parents' bias against a boy.

Supplementary material

Supplementary material is available online at the OUP website. These are the data and replication files and the Online Appendix.

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